The Spy Who Logged Me!

1) $\log(4x-1) = 2$

$10^2 = 4x-1$

$100 = 4x-1$

$101 = 4x$

$\frac{101}{4} = x$

2) $\log_3(5-x) = 3$

$3^3 = 5-x$

$27 = 5-x$

$x = 5-27$

$x = -22$

3) $\log_2(x+6) + \log_2(3) = \log_2 30$

$\log_2[(x+6)(3)] = \log_2 30$

$(x+6)(3) = 30$

$3x+18 = 30$

$3x = 12$

$x = 4$

4) $\log_3 x + \log_3(x-1) = \log_3(4x)$

$\log_3[x(x-1)] = \log_3(4x)$

$x(x-1) = 4x$

$x^2 - x = 4x$

$x^2 - x - 4x = 0$

$x^2 - 5x = 0$

$x(x-5) = 0$

$x = 0 \quad x-5 = 0$

$x = 5$

5) $\log_6(x+3) + \log_6(x-2) = 1$

$\log_6[(x+3)(x-2)] = 1$

$6^1 = (x+3)(x-2)$

$6 = x^2 - 2x + 3x - 6$

$0 = x^2 + x - 12$

$0 = (x+4)(x-3)$

$\boxed{x = -4}$ or $x = 3$

inadmissable

Cannot take log of negative.

6.) $\log_2(x+1) - \log_2(x-1) = 6$

$\log_2\left(\frac{x+1}{x-1}\right) = 6$

$2^6 = \frac{x+1}{x-1}$

$64 = \frac{x+1}{x-1}$

$64(x-1) = x+1$

$64x - 64 = x + 1$

$64x - x = 1 + 64$

$63x = 65$

$x = \frac{65}{63}$

i) $1 - \log(x-4) = \log(x+5)$

$1 = \log(x+5) + \log(x-4)$

$1 = \log[(x+5)(x-4)]$

$10^1 = (x+5)(x-4)$

$10 = x^2 - 4x + 5x - 20$

$0 = x^2 + x - 30$

$0 = (x+6)(x-5)$

$\boxed{x = -6}$ or $x = 5$

inadmissable

ii) $2^{2x} - 2^x - 6 = 0$

let $2^x = y$

$y^2 - y - 6 = 0$

$(y-3)(y+2) = 0$

$y = 3$ or $y = -2$

$2^x = 3$ or $2^x = -2$

$\log 2^x = \log 3$ not possible.

$x \log 2 = \log 3$

$x = \frac{\log 3}{\log 2}$

iii) $3^{2x} + 2(3^x) - 15 = 0$

let $y = 3^x$

$y^2 + 2y - 15 = 0$

$(y+5)(y-3) = 0$

$y = -5 \quad y = 3$

$3^x = -5 \quad 3^x = 3$

not possible $3^x = 3^1$

$x = 1$

iv) $10^{2x} + 5(10^x) + 4 = 0$

let $y = 10^x$

$y^2 + 5y + 4 = 0$

$(y+4)(y+1) = 0$

$y = -4 \quad y = -1$

$10^x = -4 \quad 10^x = -1$

not possible not possible

vi) $5^{3x} - 2(5^{2x}) - 5^x + 2 = 0$

$5^{2x}(5^x - 2) - 1(5^x - 2) = 0$

$(5^{2x} - 1)(5^x - 2) = 0$

$5^{2x} - 1 = 0$ or $5^x - 2 = 0$

$5^{2x} = 1$ $\quad 5^x = 2$

$\log 5^{2x} = \log 1$ $\quad \log 5^x = \log 2$

$2x \log 5 = \log 1$ $\quad x \log 5 = \log 2$

$x = \frac{\log 1}{2 \log 5}$ $\quad x = \frac{\log 2}{\log 5}$

$= 0$

or $5^{2x} = 1$

$5^{2x} = 5^0$

$2x = 0$

$x = 0$

$\log_2 x + \log_8 x + \log_{16} x = 25$

$\frac{1}{2}\log_2 x + \frac{1}{3}\log_2 x + \frac{1}{4}\log_2 x = 25$

$\frac{3}{2}\log_2 x + \frac{1}{3}\log_2 x + \frac{1}{4}\log_2 x = 25$

$\log_2 x \left(\frac{3}{2} + \frac{1}{3} + \frac{1}{4}\right) = 25$

$= y$

x

x

$= \log x$

$2 = \log x$

$= \frac{\log x}{\log 2}$

$= \frac{1}{2}\frac{\log x}{\log 2}$

(A) $\log_2 x = y$

$2^y = x$

$\log 2^y = \log x$

$y \log 2 = \log x$

$y = \frac{\log x}{\log 2}$

$\log_2 x = \frac{\log x}{\log 2}$